

REVIEW

Plant Resins: Chemistry, Evolution, Ecology, Ethnobotany. By JEAN H. LANGENHEIM. 2003. Timber Press, Portland, OR. 586 pp. Hardcover \$49.95. ISBN 0-88192-574-8.

Interactions between plants and animals are largely mediated by chemical products, usually produced by the plants. One such plant product, which has evolved repeatedly throughout the plant kingdom, is resin. Plant resins, and their many uses by people, animals, and the plants themselves, are the subject of a fascinating new book by Jean Langenheim.

Although the definition of natural resin varies, it is generally accepted as a plant secretion that is translucent, often sticky, and soluble in organic solvents rather than water. Resins are generally synthesized and released to defend plants against attack by microbes, insects, or other animals (Langenheim 1969). This function alone involves interactions between many thousands of plant, animal, and microbe species, in virtually every corner of the world. However, the story of plant resins is even more involved, because resins, being chemically distinctive and diverse, are also collected and used by animals, including humans, for a variety of purposes. In turn, some plants have capitalized on animal use of resins by secreting resins to attract animals rather than repel them. These animals are then manipulated to perform needed services (e.g., pollination; Armbruster 1984). Human interest in, and use of, resin has a long history. Resin has even affected popular culture: e.g., amber (fossil resin) is a semi-precious gem, prized in jewelry. The most recent manifestation of popular interest in fossil resin is as a potential source of ancient DNA (e.g., dinosaur DNA in *Jurassic Park*, although this remains clearly in the realm of fiction).

Jean Langenheim has spent much of her professional career studying the chemistry, botany, and ecology of ambers and resins. It is gratifying to see a lifetime of work with a wide cast of collaborators (e.g., Stubblebein and Langenheim 1977; Arrhenius and Langenheim 1983) reviewed authoritatively in one volume. This book is much more; it is the most comprehensive review yet written on all aspects of plant resins, from chemistry and biology to ethnobotany and commerce. The list of topics in the table of contents gives an idea of the range: 1) production of resin by plants (chemistry, biosynthesis, plant taxonomic distribution, evolutionary trends, anatomy, secretion, storage), 2) geological history and ecology (amber, plant-herbivore interactions and plant defense, animal use of resins, resin-based plant-pollinator interactions, physiological roles of resin, ecosystem significance), and 3) ethnobotany

of resins (history of human use in medicine and commerce, modern uses, future uses, and conservation).

This book is obviously a valuable treasure-trove of information about plant resins, plants that secrete them, and animals and microbes that interact with these plants. Anyone working on the ecology or chemistry of ambers, terpenoids, phenolics, or related plant products will want to read this well produced and well-illustrated book and have it handy as a reference.

I was at first uncertain just who, other than specialists, would be interested in such a scholarly, yet wide-ranging book. The book is reasonably easy to read, striking a pleasant balance between being well referenced, with scholarly journal-style citations, yet without the distraction of overly abundant citations. But the text is not entertainingly chatty, nor does it recount the personal excitement of fieldwork and scientific discovery, as might a popular book. So who then, besides a specialist, will be attracted by such a volume? The answer, I suspect, lies in the ethnobotany.

For me, the section on human use of resins was a pleasant excursion into incidental issues I knew rather little about. Upon reflection, however, I now see this section as the most important and compelling part of the book for the broader readership. After all, nearly everyone in western society has seen amber, heard of frankincense and myrrh, smelled incense, and tasted hoppy beer and perhaps even retsina (all of which contain or are resins). The cultural and commercial links of human society to plant resins are far more extensive, varied, and complex than this reader could have imagined. For example, I had no idea that kauri resin (*Agathis australis*, Araucariaceae) was one of New Zealand's main exports for over 100 years, or that this came about as a result of an English boy finding, by accident, some discarded resin floating in the Thames in 1836 (it had been brought to London for analysis but judged to be worthless; McNeill 1991). This fascinating review of the complex history of human use of resins will thus probably be the primary source of attraction for the non-specialist reader (although I hope they will also read and be fascinated by the wealth of natural history in the first half of the book).

In any book of this size (nearly 500 pages of text!), there will always be occasional inconsistencies and things to criticize. For example, on page 38, we read that β -amyrin is a component of resins only in plants in the Burseraceae, but then on page 234 we read that it is an important resin component of some plants in the Euphorbiaceae (yes, I would spot this). A few other minor inconsistencies can

be spotted, but otherwise the book is well edited and remarkably free of errors of fact or typography. There could have been more detail in a few areas. For example, I would have liked to see a little more coverage of animal uses of resin. The material that is presented is fascinating, but it leaves out many components of this area of growing interest. Although conservation is mentioned briefly in the last section of the book, one might wish to have seen the topic explored a little more thoroughly, and perhaps even passionately. Dr. Langenheim has certainly witnessed tremendous changes in tropical landscapes over her years of travel and research. Where plant resins fit into that crisis would have been interesting to explore in a little more detail. And it never hurts to raise these issues in a book that will be read by a cross-section of the voting public. But these are all minor quibbles reflecting my own biases and values.

To summarize, this is an impressive piece of scholarly work. It makes a fascinating book, which is well produced and lavishly illustrated. This is a volume that that many chemical ecologists, natural-product chemists, and ethnobotanists

will want to own. I also expect that member of the wider public who are interested in plants and their uses, or in the history of trade in plant products, will appreciate this book.

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